

## The response to a signal of a biochemical network

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Biochemical networks are the analog computers of life. They allow the cell to perform a large number of computational tasks, analogous to electronic circuits. However, their design principles are markedly different. In biochemical networks, the computations are performed by biomolecules, such as proteins and DNA, that often move erratically, namely by diffusion, and act upon each other in a stochastic manner: chemical reactions and, equally important, physical interactions are probabilistic in nature. These factors become particularly important, when the concentrations are low, as is often the case inside the living cell. It is therefore surprising that cells can respond very specifically and very robustly to a wide range of intra- and extracellular signals. We use computer simulations and analytical theory to elucidate the design principles that allow biochemical networks to respond very reliably in the presence of biochemical noise.